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Essential oil production in  
the highlands of northern

RESEARCH CORPORATION OF THAILAND

MISCELLANEOUS INVESTIGATION NO. 85  
ESSENTIAL OIL PRODUCTION IN THE HIGHLANDS  
OF NORTHERN THAILAND

REPORT NO. 1  
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BY  
NARONG CHOMCHALOW

ASRCT, BANGKOK 1975

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# ESSENTIAL OIL PRODUCTION IN THE HIGHLANDS OF NORTHERN THAILAND

By Narong Chomchalow\*

## SUMMARY

This first semi-annual report on the "Essential oil production in the highlands of northern Thailand" covers the initial stage of the research project. Collection of propagating materials of selected essential oil crops has been made through plant introduction from abroad. So far, 9 species have been collected, namely Mentha piperita, M. spicata, M. cardiaca, M. arvensis, M. canadensis, Lavendula vera, L. hybrida, Jasminum grandiflorum, and Pelargonium sp. The Essential Oil Research Station has now been established at Chang Khian (UNFDAC site B) to carry on research activities on essential oil for the highlands of northern Thailand. Two study trips have been made by the principal investigator; one to Indonesia and the other to Israel, Italy, and France. The purpose of these trips were to observe plantation of essential oil crops, method of oil extraction, marketing of the oil, and also to bring back propagating materials to be used in the research project.

## INTRODUCTION

After the Act on the Prohibition of Opium Smoking has been passed in 1959, the hill-tribes living on the high hills of northern Thailand have met with great difficulty in their existence; since opium, their primary income, has become illegal from the time the Act was promulgated. Even with aids from several agencies, both international and the Thai Government, they have to struggle for existence. Since no other crops have been found to be more suitable, opium production is their still source of income. In growing opium, they have to do shifting cultivation which destroys forest after forest and causes serious problems to all concerned.

The Applied Scientific Research Corporation of Thailand has conducted research on the essential oil crops ever since 1965. These crops possess characteristics that few other crops have that are so relevant to many of the problems confounding opium replacement. Many are plants that require semi-tropical or temperate environments not found elsewhere in Thailand.

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The essential oil can be processed on the highlands with small, locally made, portable stills, thus reducing the cost of transportation of the products to the market. The method of extraction is quite simple and is similar, in most instances, to liquor distillation familiar to the hill-tribe people. The net income of the producer is relatively high. The products are of high value, low volume, and are readily marketable. With such positive attributes there seems to be ideal for the development of essential oil production in the highlands of northern Thailand. Before following questions remain to be answered one can say with confidence which crops are to be grown: (1) Can it be grown in the highland. If so, can it produce a high-quality oil with good yield enough to initiate commercial production? (2) Can the hill-tribe people grow any of these crops? (3) Can they extract the oil? (4) Can they sell the oil? In short, is it feasible to grow the essential oil crops in the highland.

To answer these questions various aspects have to be considered. Since the crops do not exist in Thailand, they have to be imported. Observations have to be made on their adaptability, growth rates, diseases and pests, water and nutritional requirements and yield potential. For those promising crops, further works have to be done on determinations of oil quantity and quality, agronomic feasibility and improvements (e.g. propagating, planting, spacing, fertilizing, pest controlling, and harvesting), installation of a self-generated still for oil extraction at the main experimental area, development of a simple portable still suitable for use in isolated areas, etc. .

The present report covers the work done from the start up to April 1975. The delay in submitting this first semi-annual reports is caused by the following reasons:

- 1) Mrs. Ain-on Srivardhana, Head, Essential Oils and Spice Crops Unit has resigned from ASRCT since October 1974. No substitute has been approved by the Board of ASRCT.
- 2) Difficulty in the procurement of propagating materials has caused a long delay in starting the project.
- 3) The place selected for establishing a field station at Ang Khang, Fang District was found unsuitable, since it is difficult to access and labourers are rather scarce.

## ESTABLISHMENT OF THE ESSENTIAL OIL RESEARCH STATION

When the project was proposed, Doi Ang Khang in Fang District, Chiang Mai was considered as the site of the experiment; this place belongs to Kasetsart University's Highland Agricultural Project. After several visits, it was realized that such a place is not ideal for a research station on essential oil, since it is very difficult to reach. Besides, labour is scarce and rather difficult to manage. Fortunately, a piece of land about 3 acres belonging to a Moew villager located near UNFDAC's Chang Khian Site B Station was offered. After negotiation has been made, the ownership's was transferred to ASRCT at the cost of Baht 10,000. Development was then going on at this site including clearing the land (large trees had been already cut down to grow opium and, later, corn), making a path from Site B Station (about 1 km), building a residence for the Station manager, installing the water supply pipe line, preparing experimental plots, and growing the essential oil crops. The Station manager has also been recruited. It is hoped that once everything is settled, there will be no other problem likely to obstruct the future work, and that the plan to conduct the research on essential oil crops will be accomplished accordingly.

### STUDY TRIPS

The difficulty of obtaining propagating materials from abroad and the lack of experience in growing essential oil crops are two reasons why the principal investigator in charge of the project had made two study trips abroad. They were:

1) Indonesia, 1-6 July 1974. The principal investigator took the opportunity after attending the seminar on Aquatic Weeds held in Malang, East Java during 25-30 June to visit various places of interest related to the present research project, namely Malang Agricultural Experiment Station (in Malang); Industrial Crops Research Institute, Chemical Research Institute, National Biological Institute (all in Bogor); and Cibodas Botanical Garden (in Cibodas).

Two places of particular interest to the project are:

a. Chemical Research Institute, Bogor. Among the various activities,

the study on essential oils indigenous to Indonesia is also undertaken. As such, the results of research on essential oils at the Institute have become part of the basic knowledge of essential oils in the world today. The Institute also provides testing and analytical services to industries on raw materials, half-finished and finished products in conformity to the standard. The Institute is authorized to issue the Certificate of Quality for exports of several commodities including essential oils. Samples of essential oils have been sent to the Essential Oil Laboratory of this institute for analysis, namely, citronella, cananga, vetiver, and patchouli.

b. Industrial Crop Research Institute, Bogor. As its name implies, the Institute is charged with research activities on industrial crops in the field of plant breeding, agronomy, plant protection, etc. Essential oil crops such as patchouli, citronella, gingergrass, lemongrass, palmarosa, peppermint, vetiver, cinnamon, nutmeg, clove, Indonesian anise, etc., are investigated at the Institute. Also visits have been made to experimental plots and gardens of economic crops of the Institute. With the kind permission of the Director, propagating materials of Mentha spp., namely M. piperita, M. arvensis, M. canadensis have been brought back to Thailand.

2) Israel - Italy - France, 22 August - 8 September 1974. When the Government of Israel extended an invitation to senior staff of ASECT to make a study tour in Israel for possible institutional linkage, the principal investigator was one of the three invitee. From Israel, the spearmint (Mentha spicata) was collected for further study in the Project. In Italy, with the kind cooperation of the Agricultural Attaché of the Royal Thai Embassy in Rome, contacts were made for visiting following stations:

a. Experiment Station for the Industry of Essential Oils, Reggio Calabria in Southern Italy. Among the various functions of the Station, research on the production of flower oils (lavender, lavandin, jasmine, etc.) and leaf oils (peppermint, spearmint, geranium, etc.) is conducted. The laboratory of the Station was very well equipped for essential oil analyses. With the kind permission of the Station's Director, an observation on plantations of bergamot, lavender, lavandin, spearmint,

peppermint, and jasmine was arranged, and propagating materials of these species were brought back to Thailand.

b. Domenico Ulrich Company, Torino in Northern Italy. Unfortunately, the office was closed, since August is a vacation month in Italy. However, a visit was paid to a plantation of peppermint. It is apparent that the first planting of peppermint starts in April; the crops are harvested in August during the blooming stage, and continuing until December. Distillation takes place the next day after harvest; the yield of oil is about 0.2%. The spent hay is put back to the farm as manure.

In France a visit was paid to Grasse, the perfume capital in the South, to observe the plantation of lavender and lavandin. Also a visit to the Tournaire Company was made to discuss the type of distillation unit to be used in the second phase of the project with the President of the Company.

In Paris a discussion on the market potentials of certain essential oils was undertaken with the Director of the Essential oil Syndicat.

#### COLLECTION AND MULTIPLICATION OF PLANT MATERIALS

Since essential oil crops, considered to be used in the experiment, are not native to Thailand, they have to be introduced from abroad. Several difficulties involve in this regards, namely:

- 1) Correspondence was not successful, one is always unwilling to supply plant materials for this purpose.
- 2) Personal contact is a success, but rather costly and time consuming.
- 3) The propagating materials are mostly cuttings and stolons which are very difficult to keep viable during the long journey.
- 4) The plant materials brought into the country under (2) and (3) are not so vigorous, since they are kept in the luggage for so long while travelling. Many of them did not survive.
- 5) The weather in Bangkok, or even at Chiang Mai during the summer was too hot for plants introduced, especially lavender and lavandin. With the establishment of the Essential oil Research Station at Chang

Khian, where the climate is milder than in the lowland, it is to be hoped that the new plant materials due to arrive shortly will have a better chance of survival.

However, several varieties of species of the essential oil crops are now being multiplied both at ASRCT in Bangkok and at the Essential Oil Station at Chang Khian. The list of the varieties and species and the date of introduction is presented as follows:

1) Peppermint (*Mentha piperita*). Three varieties of peppermint have so far been introduced. They are:

1.1 From Indonesia. Personally introduced into Thailand by the principal investigator from the Industrial Crops Research Institute, Bogor, Indonesia on 6 July 1974. It shows vigorous growth at ASRCT. Designated as "Peppermint Indonesia".

1.2 From Reggio Calabria, Italy. Personally introduced from a farm near Reggio Calabria, Italy on 6 September 1974. The performance at ASRCT is good. Designated as "Peppermint Italy #1".

1.3 From Florence, Italy. Through the courtesy of Mr. Pairaj Laowhaphan, Agricultural Attaché of the Royal Thai Embassy in Rome, this variety was received on 15 February 1975. It shows a very vigorous growth at ASRCT. Besides, it possesses very attractive odour. It is the most promising variety of all mint species under investigation. Designated as "Peppermint Italy #2".

2) Spearmint (*M. spicata*). Five varieties have so far been introduced, namely:

2.1 From U.S.A. Through the courtesy of Dr. Wallace M. Manis, USDA Official at Chiang Mai U.S. Consulate, this variety has been introduced into Thailand in June 1974. The performance both at Chiang Mai and ASRCT is good. Designated as "Spearmint U.S. #1".

2.2 From Israel. Personally introduced from Israel on 28 August 1974. Designated as "Spearmint Israel".

2.3 From Reggio Calabria. Personally introduced from a farm near Reggio Calabria, Italy on 6 September 1974. Designated as "Spearmint Italy #1".



2.4 From Indiana, U.S.A. Mr. Chaisil Maneenont of the Ecological and Environmental Research Institute, ASECT introduced into Thailand on 26 November 1974. It shows good growth. Designated as "Spearmint U.S. #2".

2.5 From Florence, Italy. Mr. Pairaj Laowhaphan sent together with peppermint on 15 February 1975. It shows very vigorous growth. Designated as "Spearmint Italy #2".

3) Scotch spearmint (M. cardiaca). Dr. Manis introduced into Thailand in June 1974. It shows vigorous growth both at Chiang Mai and at ASRCT. Designated as "Scotchmint".

4) M. canadensis. Personally introduced from the Industrial Crops Research Institute, Bogor, Indonesia on 6 July 1974. It shows vigorous growth at ASRCT.

5) M. arvensis. Personally introduced from the Industrial Crops Research Institute, Bogor, Indonesia on 6 July 1974. It shows very vigorous growth at ASRCT.

In addition to the five species of Mentha listed above, ASRCT has also introduced or collected ten varieties or clones of Japanese mint (M. arvensis var. piperascens), one clone each of M. arvensis var. javanica, M. pulegium, and M. viridis. They are being used in a breeding programme in order to produce new varieties of mint which give higher yield of good quality oil. Several hybrids are now produced, some of which exhibit vigorous growth.

6) Lavender (Lavendula vera). Personally introduced from Reggio Calabria, Italy on 6 September 1974. However, the cuttings could not tolerate long journey, and soon died down. Another introduction was made through the courtesy of Mr. Pairaj Laowhaphan in Rome who arranged to send 5 kg of lavender cuttings from Florence, Italy. They are now being propagated both at ASRCT and Chiang Mai.

7) Lavandin (Lavendula hybrida). Same statement as (6) above.

8) Italian Jasmine (Jasminum grandiflorum). Personally introduced from Reggio Calabria, Italy on 6 September 1974. Again, the cuttings died as the result of the long journey. New batch of cuttings is expected to arrive from Italy soon.

9) Geranium (Pelargonium spp.). Personally introduced from Reggio Calabria, Italy on 6 September 1974. Again, the cutting died, and new batch of cutting is expected to arrive from Italy soon.

#### CONCLUSION

In carrying out this research project, several obstacles have been faced with, particularly on the administration and regulation problems of ASRCT, the shortage of staff, the availability of experimental area and facilities. Most important of all is the availability of propagating materials, without which the research project cannot be started. Since most of the obstacles have now been solved, the research will be actively conducted during the on-coming rainy season.